

CLAIMS

What is claimed is

- 1 1. A method of handling lock contention, the method comprising the steps of:
 2 a first requester transmitting to a lock management system a first request for a
 3 particular lock on a resource;
 4 wherein said lock management system manages locks on resources that may be
 5 granted to a plurality of processes that can access said resource;
 6 receiving a message from said lock management system that indicates that said first
 7 request to lock a resource is denied;
 8 wherein a blocking condition caused the denial of said first request;
 9 wherein said message includes first data; and
 10 based on said first data, said first requester transmitting a second request for
 11 notification that said blocking condition should no longer cause denial of a
 12 request for a lock on said resource.
- 1 2. The method of claim 1, wherein no process of said plurality of processes holds a lock
 2 issued by said lock management system for said resource.
- 1 3. The method of claim 1, wherein the steps further include:
 2 said first requester receiving said notification; and
 3 in response to receiving said notification, said first requester transmitting another
 4 request to said lock management system for said particular lock on said resource.
- 1 4. The method of claim 3, wherein the step of said first requester transmitting another
 2 request includes transmitting second data that indicates that said blocking condition
 3 should no longer cause denial of a request for said lock of said resource.

1 5. The method of claim 4, wherein the steps further include said lock management
2 system processing said other request without denial based on said second data.

1 6. The method of claim 1, wherein:
2 a second process of said plurality of processes is performing an operation that causes
3 said blocking condition;
4 said first data identifies another resource locked by said second process for which
5 said first requester may acquire a lock when said blocking condition should no
6 longer cause denial of a request for said lock of said resource; and
7 wherein the step of transmitting said second request includes transmitting a request
8 for said lock on said other resource.

1 7. The method of claim 1, wherein:
2 said first requester is a process of said plurality of processes;
3 wherein said resource is a data block in a b-tree index; and
4 wherein a second process of said plurality of processes is performing a block split
5 operation on said data block.

1 8. A method of managing locks by a distributed lock management system, the method
2 comprising the steps of:
3 a first lock manager on a first node receiving a first request for a first lock on a
4 resource from a first requester;
5 wherein said distributed lock management system includes said first lock manager;
6 determining that said first request may not be granted because of a blocking
7 condition;

8 said first lock manager storing in a data structure first data that may be used by said
 9 first requester to obtain notification that said blocking condition should no
 10 longer cause denial of a request for a lock on said resource; and
 11 said first lock manager transmitting to said first requester a first response that:
 12 indicates that said first request is denied, and
 13 includes a copy of said first data.

1 9. The method of claim 8, wherein the steps include:
 2 receiving a message that indicates that said blocking condition should no longer cause
 3 denial of a request for a lock on said resource; and
 4 modifying said data structure to indicate that said blocking condition should no longer
 5 cause denial of a request for a lock on said resource.

1 10. The method of claim 9, wherein the step of receiving said message includes receiving
 2 said message from said first requester.

1 11. The method of claim 8, wherein:
 2 the steps further include said first lock manager transmitting to another lock manager
 3 of said distributed lock management system a message requesting said first
 4 lock on said resource; and
 5 wherein the step of determining is based on a second response received from said
 6 other lock manager indicating that said first request cannot be granted;
 7 wherein said second response includes a copy of said first data.

1 12. The method of claim 8, wherein the steps further include:
 2 receiving a second request for another lock on said resource;
 3 determining, based on said first data, that said second request may not be granted;

4 said first lock manager transmitting to said second requester another response that:
 5 indicates that said second request is not granted, and
 6 includes a copy of said first data.

1 13. The method of claim 12, wherein:
 2 said first lock manager is a master of said resource; and
 3 wherein the step of receiving said second request includes receiving said second
 4 request from another lock manager.

1 14. The method of claim 12, wherein:
 2 said first lock manager and a process are on a node, wherein said process is different
 3 than said first requester; and
 4 the step of receiving said second request includes receiving said second request from
 5 said process.

1 15. The method of claim 8, wherein:
 2 said distributed lock management system includes a master for said resource; and
 3 wherein no lock is currently granted for said resource by said master.

1 16. A computer-readable medium carrying one or more sequences of instructions for
 2 handling lock contention, wherein execution of the one or more sequences of
 3 instructions by one or more processors causes the one or more processors to perform
 4 the steps of:
 5 a first requester transmitting to a lock management system a first request for a
 6 particular lock on a resource;
 7 wherein said lock management system manages locks on resources that may be
 8 granted to a plurality of processes that can access said resource;

9 receiving a message from said lock management system that indicates that said first
 10 request to lock a resource is denied;
 11 wherein a blocking condition caused the denial of said first request;
 12 wherein said message includes first data; and
 13 based on said first data, said first requester transmitting a second request for
 14 notification that said blocking condition should no longer cause denial of a
 15 request for a lock on said resource.

1 17. The computer-readable medium of claim 16, wherein no process of said plurality of
 2 processes holds a lock issued by said lock management system for said resource.

1 18. The computer-readable medium of claim 16, wherein the steps further include:
 2 said first requester receiving said notification; and
 3 in response to receiving said notification, said first requester transmitting another
 4 request to said lock management system for said particular lock on said resource.

1 19. The computer-readable medium of claim 18, wherein the step of said first requester
 2 transmitting another request includes transmitting second data that indicates that said
 3 blocking condition should no longer cause denial of a request for said lock of said
 4 resource.

1 20. The computer-readable medium of claim 19, wherein the steps further include said
 2 lock management system processing said other request without denial based on said
 3 second data.

1 21. The computer-readable medium of claim 16, wherein:

a second process of said plurality of processes is performing an operation that causes
 said blocking condition;
 said first data identifies another resource locked by said second process for which
 said first requester may acquire a lock when said blocking condition should no
 longer cause denial of a request for said lock of said resource; and
 wherein the step of transmitting said second request includes transmitting a request
 for said lock on said other resource.

22. The computer-readable medium of claim 16, wherein:
 said first requester is a process of said plurality of processes;
 wherein said resource is a data block in a b-tree index; and
 wherein a second process of said plurality of processes is performing a block split
 operation on said data block.

23. A computer-readable medium carrying one or more sequences of instructions for
 managing locks by a distributed lock management system, wherein execution of the
 one or more sequences of instructions by one or more processors causes the one or
 more processors to perform the steps of:
 a first lock manager on a first node receiving a first request for a first lock on a
 resource from a first requester;
 wherein said distributed lock management system includes said first lock manager;
 determining that said first request may not be granted because of a blocking
 condition;
 said first lock manager storing in a data structure first data that may be used by said
 first requester to obtain notification that said blocking condition should no
 longer cause denial of a request for a lock on said resource; and

13 said first lock manager transmitting to said first requester a first response that:

14 indicates that said first request is denied, and

15 includes a copy of said first data.

1 24. The computer-readable medium of claim 23, wherein the steps include:

2 receiving a message that indicates that said blocking condition should no longer cause

3 denial of a request for a lock on said resource; and

4 modifying said data structure to indicate that said blocking condition should no longer

5 cause denial of a request for a lock on said resource.

1 25. The computer-readable medium of claim 24, wherein the step of receiving said

2 message includes receiving said message from said first requester.

1 26. The computer-readable medium of claim 23, wherein:

2 the steps further include said first lock manager transmitting to another lock manager

3 of said distributed lock management system a message requesting said first

4 lock on said resource; and

5 wherein the step of determining is based on a second response received from said

6 other lock manager indicating that said first request cannot be granted;

7 wherein said second response includes a copy of said first data.

1 27. The computer-readable medium of claim 23, wherein the steps further include:

2 receiving a second request for another lock on said resource;

3 determining, based on said first data, that said second request may not be granted;

4 said first lock manager transmitting to said second requester another response that:

5 indicates that said second request is not granted, and

6 includes a copy of said first data.

1 28. The computer-readable medium of claim 27, wherein:
 2 said first lock manager is a master of said resource; and
 3 wherein the step of receiving said second request includes receiving said second
 4 request from another lock manager.

1 29. The computer-readable medium of claim 27, wherein:
 2 said first lock manager and a process are on a node, wherein said process is different
 3 than said first requester; and
 4 the step of receiving said second request includes receiving said second request from
 5 said process.

1 30. The computer-readable medium of claim 23, wherein:
 2 said distributed lock management system includes a master for said resource; and
 3 wherein no lock is currently granted for said resource by said master.

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